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(54) **Improvements in internal elevators**

(57) An internal elevator for lifting a pipe or pile (11) comprises a plurality of gripper assemblies (14) which are radially movable into engagement with the interior wall of the pipe or pile. A ram (13) controls relative axial movement of first and second body members (12a, 12b) and this axial movement is translated into radial movement of the gripper assemblies by means of pivotally connected struts (18) hinged at their respective ends by pins (20) to members (12a) and gripper assemblies (14). Hoisting by means of eye (21) increases the face applied to the pipe by the elevator.

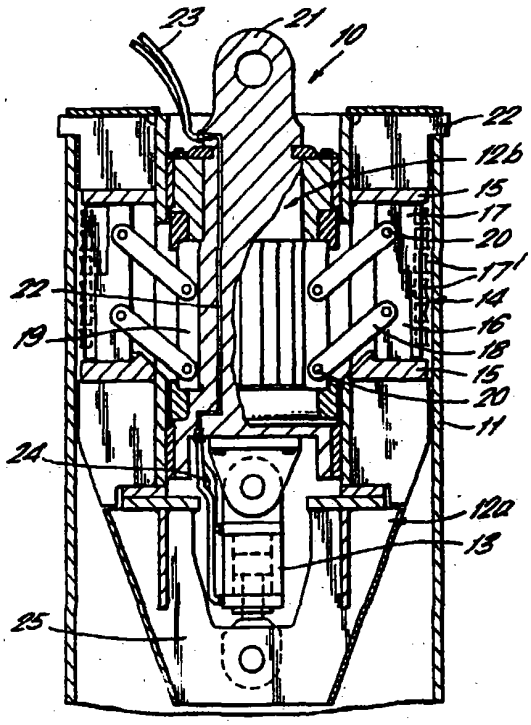

FIG. 1.

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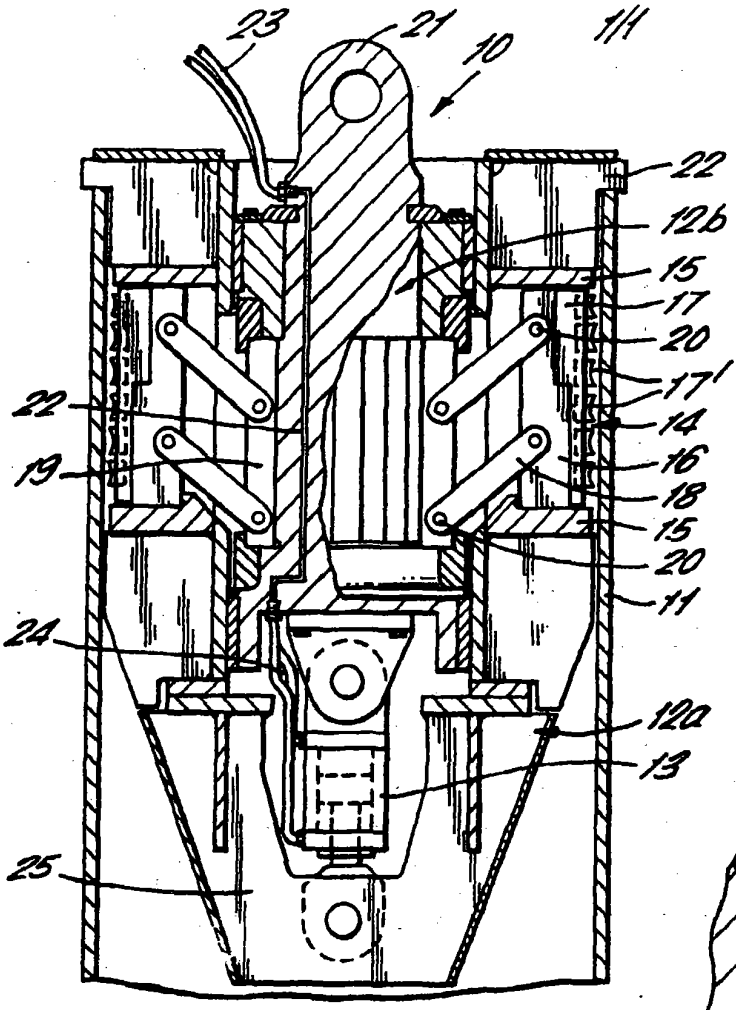


FIG. 1.

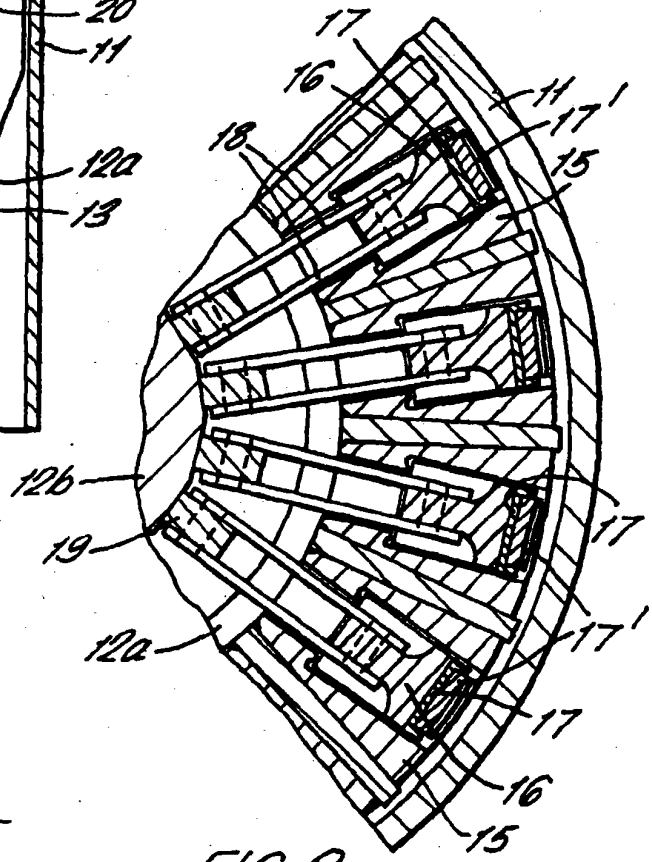
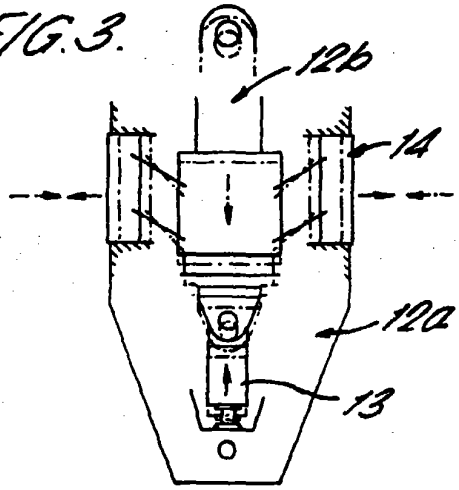


FIG. 2.

FIG. 3.



IMPROVEMENTS IN INTERNAL ELEVATORS

This invention relates to internal elevators, which are used in handling pipes or piles.

Existing elevators, eg, as described in U.S. patent No. 4320915 or 4235469, comprise a plurality of slips which are radially movable by wedge type means into engagement with the interior wall of the pipe or pile. The force with which these slips are pressed against the pipewall is a combined function of wedge angle and friction between the engaging wedge surfaces. However, the friction coefficient between the engaging wedge surfaces is uncertain, the optimum only being reached after proper greasing. Seawater, sand, dirt etc., affect this friction coefficient, resulting in a significant fluctuation of the actual radial force applied against the pipewall. The unpredictability of the radial force being applied to the pipewall is undesirable because too much force will damage the pipe or pile and too little force will allow the pipe or pile to slip out of engagement with the elevator.

According to the present invention there is provided an internal elevator of the kind comprising a body which is insertable axially into a hollow end portion of a pipe or pile and which has a plurality of gripper assemblies mounted movably thereon to be engagable with the interior wall of the pipe or pile when the body is within the hollow end portion thereof, in which said body comprises first and second body members which are movable axially with respect to one other, actuator means is provid d for effecting r lative axial movement between the first and second body memb rs, the first b dy member has m ans for

constraining the gripper assemblies for movement radially relative to th first body member, and a plurality of strut means are provided connected between the second body member and the gripper assemblies and arranged to effect movement of the gripper assemblies radially relative to the first body member when said actuator means effects relative axial movement of the first and second body members, there being means provided on the body for connection to a hoisting device.

Preferably, means is provided for locating the body axially with respect to the pipe or pile upon insertion of the body into the hollow end portion thereof, and said locating means may be provided on said first body member.

The means for connection to a hoisting device may be provided on said second body member. The first and second body members and said strut means are preferably arranged such that when the gripper assemblies are in engagement with the interior wall of the pipe or pile and the body is hoisted therewith, the force from the weight of the pipe or pile acting on the first and second body members is in a sense tending to cause relative axial movement therebetween so as to cause radial outward movement of the gripper assemblies.

The strut means are preferably pivotally connected to the second body member and the gripper assemblies respectively by low-friction hinges.

The actuator means preferably comprises a pressure fluid operated piston and cylinder device, eg, hydraulic ram, and part of the pressure fluid

supply therefor is provided integrally with the second body member.

The first body member preferably comprises a tapering end section for facilitating insertion of the body into the hollow end portion of the pipe or pile.

By way of example, embodiments of the invention will now be described with reference to the accompanying drawings, in which:

Figure 1 is a part sectional elevation showing an internal elevator according to the invention,

Figure 2 is a partial section through lines 2-2 of Figure 1, and

Figure 3 is a diagrammatic illustration of the operation of the elevator.

An internal elevator 10 is seen in Figure 1 inserted axially into a hollow end portion of a pipe or pile 11. The body of the elevator has two parts : a first body member 12a and a second body member 12b. The first and second body members 12a, 12b are arranged to be axially movable with respect to one another, with the second body member 12b here being housed concentrically within the first body member 12a, as can be seen most clearly in Figure 3. An actuator 13, conveniently a hydraulic ram, is connected between the first and second body members 12a, 12b for effecting relative axial movement between the first and second body members. Suitable low-friction guides and bearing surfaces are preferably provid d on the first and sec nd body members 12a, 12b to ease their relative axial movements.

A plurality of gripper assemblies 14 are mounted on the body of the elevator to be movable radially outwardly into engagement with the interior wall of the pipe or pile 11. The gripper assemblies 14 are constrained for radial movement relative to the body of the elevator by means of guideways 15 which are provided on the first body member 12a. The gripper assemblies 14 here comprise base plates 16 on which are mounted gripper plates 17 carrying hardened inserts 17', as seen in Figure 1, which provide serrations or teeth to bite into the pipewall material and hence achieve a secure purchase on the pipe or pile 11.

A plurality of struts 18 are provided connected between the gripper assemblies 14 and the second body member 12b, here by pivotal joints on respectively the base plates 16 of the gripper assemblies and hinge blocks 19 which are attached to the second body member. The struts 18 are arranged at an angle, as seen in Figure 1, and the geometry is such that relative axial movement of the first and second body members 12a, 12b causes radial movement of the gripper assemblies 14.

As seen in Figure 3, extension of the ram 13 causes relative axial movement between the first and second body members 12a, 12b such as to cause movement of the gripper assemblies 14 radially outwardly. In this movement, the struts 18 act as compression links between the gripper assemblies 14 and the second body member 12b. Contraction of the ram 13 leads to radially inward movement of the gripper assemblies 14.

The struts 18 are connected to respectively the gripper assemblies 14 and th s c nd body member

12b by suitable low-friction pivotal joints, eg using pins 20 and with appropriately selected materials such as stainless steel/bronze/teflon etc. In this way, the friction losses in the pivotal joints of the struts 18 can be kept to negligible proportions.

For connecting the elevator to a hoisting device, eg to a crane hook, a lifting eye 21 is provided. Here, the lifting eye 21 is provided on the second body member 12b.

For locating the elevator axially when it is inserted into the hollow end portion of the pipe or pile 11, a shoulder 22 is provided. Here, the shoulder 22 is provided on the first body member 12a.

It will be seen that the first and second body members 12a, 12b and the struts 18 are so arranged that the weight of the pipe or pile 11 when it is lifted acts on the first and second body members in such a way as to cause radial outward movement of the gripper assemblies 14.

Conveniently here, part of the pressure fluid supply for the ram 13 is provided integrally with the second body portion 12b in the form of conduits 22 to which pressure lines 23, 24 are connectable.

The elevator is provided with a tapering end section 25 to facilitate insertion into the hollow end portion of the pipe or pile 11. Here, the tapering end section 25 is mounted removably on the first body member 12a.

The elevator described here has the advantage that frictional losses are kept to a minimum and are

predictable, which enables more accurate control of the force applied to the pipewall by the gripper assemblies.

CLAIMS:

1. An internal elevator of the kind comprising a body which is insertable axially into a hollow end portion of a pipe or pile and which has a plurality of gripper assemblies mounted movably thereon to be engagable with the interior wall of the pipe or pile when the body is within the hollow end portion thereof, in which said body comprises first and second body members which are movable axially with respect to one other, actuator means is provided for effecting relative axial movement between the first and second body members, the first body member has means for constraining the gripper assemblies for movement radially relative to the first body member, and a plurality of strut means are provided connected between the second body member and the gripper assemblies and arranged to effect movement of the gripper assemblies radially relative to the first body member when said actuator means effects relative axial movement of the first and second body members, there being means provided on the body for connection to a hoisting device.

2. An internal elevator as claimed in Claim 1 and further comprising means for locating the body axially with respect to the pipe or pile upon insertion of the body into the hollow end portion thereof.

3. An internal elevator as claimed in Claim 2 wherein said locating means is provided on said first body member.

4. An internal elevator as claimed in any preceding claim wherein said m ans for c nnection to a

hoisting device is provided on said second body member.

5. An internal elevator as claimed in Claim 4 wherein the first and second body members and said strut means are arranged such that when the gripper assemblies are in engagement with the interior wall of the pipe or pile and the body is hoisted therewith, the force from the weight of the pipe or pile acting on the first and second body members is in a sense tending to cause relative axial movement therebetween so as to cause radially outward movement of the gripper assemblies.

6. An internal elevator as claimed in any preceding claim wherein said strut means are pivotally connected to the second body member and the gripper assemblies respectively by low-friction hinges.

7. An internal elevator as claimed in any preceding claim wherein said actuator means comprises a pressure fluid operated piston and cylinder device and part of the pressure fluid supply therefor is provided integrally with the second body member.

8. An internal elevator as claimed in any preceding claim wherein the first body member comprises a tapering end section for facilitating insertion of the body into the hollow end portion of the pipe or pile.

9. An internal elevator substantially as hereinbefore described with reference to the accompanying drawings.